

AVIATION

The Oldest American Aeronautical Magazine

JULY 13, 1925

Issued Weekly

PRICE 10 CENTS



Postmaster General New starting the New York-Chicago Night Air Mail

International Newsphoto Photo

VOLUME
XIX

SPECIAL FEATURES

NUMBER
2

SPAR DESIGN

THE WOODSON FOTO

NEW YORK-CHICAGO NIGHT AIR MAIL

GARDNER PUBLISHING CO., Inc.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y.
under Act of March 3, 1879.



WRIGHT WHIRLWIND J-4, 200 H.P. Air-Cooled Engines have been selected by the Navies of Chile, the British, Colombian, Cuban, the first being chosen recently, and those from Cuba are the first of their country which demonstrate the power built in the power plant.

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VOL. XIX

JULY 15, 1925

No. 2

A Significant Change

WHEN the requirement was made of the requirement for a \$4,000 bond to be deposited with the Air Service before a civilian pilot could land on Air Service fields, AVIATION predicted that this rule would act as a hindrance to the development of commercial flying.

It is a pleasure to note that this obnoxious paragraph has been amended. On June 26, the War Department announced that it would no longer require that "All persons before obtaining permission to use airfield facilities as contemplated in Paragraphs 1, 2 and 3 above must furnish a bond for \$4,000 to protect the Government against damage to property." This revision is a recognition of the fact that Air Service fields may be occupied in the same way as are military roads. They are built and maintained by the Government primarily for military purposes in time of war but in time of peace should be at the service of the public.

Another Epoch Starts

WHATEVER may be the future of commercial aviation the date July 3, 1925, when the New York Chicago and Air Mail started will mark the beginning of the first real test in the history of the ability of commercial air transport. Hitherto, the route has been between cities where the volume of traffic that would permit air mail has not been sufficient to make them self-supporting or the schedules have given little advantage over the railroad. Now, for the first time, two great cities have been so linked together by air that the service will afford a great saving of time over railroad transportation.

While we have never considered that the success of the Air Mail was dependent solely on its saving capacity, it will be of the greatest interest to watch the gains that are made in this direction. It was disappointing to read that Colonel Henderson landed, in Chicago, on the night of the opening of the new service, that there might be a withdrawal of certain portions of the western Air Mail service because of lack of support. Even though the postage has been disappointing, the availability of this fast service between coast-to-coast has been worth all that it has cost the government. Now that that, any thought of its discontinuance should be met with every demand against that one be made.

The Air Mail traffic problem is one that is not easy of solution. Growing a demand for anything requires two very different elements, publicity and advertising. Publicity only brings results from those who want to buy. Advertising creates market, and sells to those who would not buy without a direct appeal to their individual advantage. The Air Mail situation definitely when traffic stimulation is needed. It

has and has involved great publicity, but its advertising is limited to such a great extent and so small results. There is no opportunity available for advertising. It is here that the weakness of any government ownership and operation is found. If the Air Mail were privately owned all the ingenuity of advertising skill would be utilized to attract traffic. Perhaps after all, the Air Mail will in the future be regarded as demonstrating only the feasibility of air transport. Private management may make it financially profitable.

Our congratulations are extended to those who planned the new night flying route, to those who have led out the routes, to the public and, of course, to the men on whom the whole service rests, the ground personnel.

Getting Under Way

ALMOST every week for the past few years there have been announcements of commercial airlines which were about to start operations. Many operators had become so excited that even the opposing list of directors of the National Air Transport Corp. left them without any objection that a real commercial airline was to be started. The actual placing of an order for ten airplanes and thirty-five engines at a manufacturer's plant. It is the first step toward the air transport business to be planned in this country. The early laying of the road to new machines will soon be a very small beginning but it must be realized that a modern plane is capable of doing an immense amount of flying at least uniformly and properly handled. Some of the English planes have flown over 3,000 hrs. so that if one trip a day each way were made between New York and Chicago for 300 days during the year less than three planes would be actually worn out during the course of one year.

The N.A.T. was fortunate in that the Air Mail competition had brought out a large number of planes ordered for the work to be done and obviously the N.A.T. will profit by all the ideas incorporated in the new ships which are being turned out by the Air Mail. It is to be hoped that the directors of the N.A.T. will also have sufficient vision and courage to launch out somewhat from the very conservative line of development followed by the Air Mail. It is claimed for example that a modern engine with its lighter weight and greater reliability will in the long run be more economical than a Liberty engine whose original cost is much higher. There is also the question of multi-engine machines which are becoming so prominent on the European air lines.

All these things are interesting propositions for the future, but the N.A.T. is financially successful as its venture. In the meantime the company has actually placed a substantial order and should receive the compensation of the cost of the aeronautical community.

Direct Solution of Airplane Spar Design*

By IVAN H. DRUGGS[†]

Until this time, to the writer's knowledge, there has been no attempt made to develop any procedure whereby an airplane wing spar may be designed directly, without recourse to trial and error.

The so-called previous method recently adopted by the Air Service and the Navy Department, although somewhat more laborious in use at present, may be so simplified by a few very reasonable assumptions as to make it possible to solve directly for the location of the struts in a trapezoid form. After the beam bending load and compression load has been determined to the word answer, a very simple calculation gives the necessary moment of inertia. With the center length given from the estimates of the airfoil used, and the moment of inertia calculated, the remaining dimensions of the beam follow easily.

Such a simplified calculation has many advantages! The new wing permits a much better comparison of weights with different braced and strutted airfoil preliminary design than can be done under the older method, and consequently leads to more efficient structures. Final design calculation is greatly simplified, a better understanding of the phenomena at stress as it relates to the design of airplane wing beams is given to the average non-inboard member.

The following assumptions are made in order that a solution may be reached as outlined above:

1. The moment of inertia and the depth of the wing beam are both constant throughout its length.

2. The numerical values of the maximum bending moments on the beam are all equal.

3. The end load produced by the wing line equals the Euler crippling load for the beam, between points of support, as a pin ended column.

Consider first the upper front (or rear) spar of a single bay airplane fixed or cantilevered at its inner ends. (Fig. 1.)

From assumption 2: $M_u = -M_{re} = M$.

By symmetry: $S_u = S_{re} = M_{max}$.

And: $D_u = M_u = wL$; $D_{re} = M_{re} = wL$.

Where w = bending beam load in lb./in.

and L = $\frac{EI}{P}$.

P = End load.

I = Moment of Inertia of Spar.

and E = Modulus of Elasticity of the material used.

Then from the formulae of the Previous Method:

$M_{max} = \frac{1}{2} (wL + wL) = -wL = -M$.

Therefore: $M = wL$.

$M = \frac{1}{2} (wL + wL) = wL$.

Since from assumption 2:

$L = \frac{EI}{P}$.

Then: $M = wL = \frac{EI}{P}$.

Therefore $M = wL$.

Let $w = -3333$ lb./in., when the deflection of the tip bending stress was assumed to vary as a semi-ellipse.

and $P = \frac{EI}{L}$.

Then $y = \frac{3333L}{EI}$.

That $y = \frac{3333L}{EI}$.

This formula gives the location of the center strut for any trapezoid under the above assumptions and enables the designer to proceed at once with the determination of the true loads and spar sizes.

Referring to assumption 3 above,

$L = \frac{EI}{P}$.

Therefore $L = \frac{EI}{P}$.

Then $L = \frac{EI}{P}$.

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$$\begin{aligned} f_s/4L, f_s &= \frac{5475}{1602} = -3.42 \\ \text{Weight of spar} &= \frac{1728}{1.5 \times 4.5} = 162 \text{ lb.} \\ \text{Width of Spar} &= 3 = 1.5 \text{ in.} \\ \text{Moment of Inertia of solid} &= \frac{1728}{1.5 \times 4.5} = 11.91 \text{ in.}^4 \end{aligned}$$

To be reached by routing 11.91 — 8.816 = 3.075 in.⁴

Let $d = 2$ in. (guess $D = 18$)

Then $I/12 = 3.075 \text{ in.}^4$

$I = 3.690 \text{ in.}^4$

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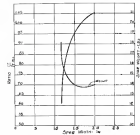
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When the pin is not symmetric and the moment at the lower end is zero a solution may be reached the same as for the fixed end beam but the value of "y" is quite large (about 75) and the member length becomes very long. This increases the bending stress and consequently the spar weight will also increase the liability of wing tip flutter. The solution of the case of the central pinned beam is not given here because it is too complicated to be presented. It is not the best arrangement that may be obtained.

Diaphane Fixed at Inner End—2 or More Bays

By assumption 2 the maximum bending moment is all equal. The center bay and the cantilever are the same as a single bay beam, the previous problem.

Therefore $L = \frac{EI}{P}$.

Let $L = \frac{EI}{P}$.

And $L = \frac{EI}{P}$.

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Final Design

This spar is not quite strong enough since the ratio of $f_s/4L$ to f_s is greater than unity. Plotting this ratio against beam width in Fig. 2 shows that a spar of 1.85 width will be just strong enough. The weight of this spar will be 22.8 lb. as shown by the curve of weight in Fig. 3.

This calculation shows that there is little to be gained by increasing the width beyond 1.85 in. although the spar is somewhat too strong. The saving in material would not be worth the use of the narrower beam.

The preceding argument has considered but one special case in the design of airplane wing spars, namely the design of the upper beam of a single bay system fixed at its inner end. Naturally the same data may be applied to the lower beam in a similar manner as well as to the spars of a biplane or triplane. The proportions for a multiple bay beam follow directly from the single bay and are given below. It however a centrally located pin joint is used for the

New York-Chicago Night Air Mail

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Post Office Department Starts New Service to Save a Business Day Between New York and Chicago

On July 1, the first anniversary of the transcontinental service, Post Office Department's registered airtel service between Chicago and New York. This service has been demanded by the business interests of both cities for a long time and would have been incorporated in the through-polar transcontinental service, had the geographical situation been different. The benefits of this new service are not limited to Chicago and New York, however. Airlines received a letter from Postoffice post marked 5:00 p.m. July 1 in that city, as the first delivery July 2.

The departure of the first plane was made the occasion of great public gatherings. In Cleveland, the transfer of the mail from one plane to another was made the extraordinary event at the tremendous accident to the opening of the Municipal Airport. Probably a quarter of a million people thronged the start or garage of the first plane over the route. At Cleveland, New York and Chicago extra details of police were required to keep the public from overwhelming the pilots and planes.

New York

Excuse of an exceptionally heavy mail, owned by a large number of overseas letters from New York and to relatives, business associates and friends in Chicago, two planes were dispatched from Hickory Field. The first plane was sent ahead of scheduled time and left the field at 8:45 p. m., Eastern Daylight Saving Time. The regular schedule commenced with the departure of the second plane at 9:30 p. m.

The first plane was piloted by D. C. Smith, a veteran of the Cheyenne Cheyenne night run of the transcontinental air mail service. It carried three sacks of mail weighing eighty-seven pounds. It was followed two hours later by a second plane loaded with thirty-six mail sacks and piloted by J. D. Hill. The mail load of the second plane was well over two hundred and fifty pounds.

Corynorhinus L. H. Redburn, flying westward of its power, arrived at Hadley Field from Langley Field, Va., in a Martin bomber piloted by Lieut. John M. Davis. As soon as mail pilot J. D. Hill had disengaged westward with the sound horn of Chicago and Mr. Redburn climbed aboard the bomber and was now headed north to Langley Field with a three-quarter moon furnishing the only illumination for the route.

The Iowa Liberty Riders' planning phase, plotted by Charlie Collier, formerly of the air mail, flew over from its Long Island hotel with 22 aboard, including Col Harold E. Hartney, head of the General Airways and newspaper car roadshows.

Frank H. Russell, vice-president, and C. R. Graham, chief engineer of the Carter Company, flew over from Garden City to a Carter Oriskany piloted by Shivers. The following morning they expected to fly to Washington on business of the Carter company.

A Contrast

Then a gale blows from the back of ancient Americas, snatches factoids out of the darkness into the glare of the 180,000,000 reader power flood light. It was an irrefragable force. The poet landed and then tumbled to the far bounding strap from the crowd—a reminder to impatient enthusiasts that justice after all has progressed since the first Jesus took the air.

And bearing on aluminum progress Glen H. Colvin, General Manager of the Pioneer Instrument Company, remarked that the present special date is a commercial invitation, marked also by entry into the field—with the Gaston Motor Co. of Hammond—back in 1911. Two streamlined racers

landing countflights are attached to the upper margin of the lower wings of each right anal plate.

W. Wallace Kofelt of Philadelphia, American representative of Frances Pinner, Ansett captain and the B. B. Y. Corp. the latter member of the B. B. Y. fleet which chartered the cars on and 5045 between New York and Chicago, explained the working of the 500,000.00. p. Halfday Day Light. At the time, the great light was being used by a series of news photographers to get the most news and with what out which is common economy can successfully take place. It is said that a pilot may lead directly during the last of the B. B. Y. fleet.

"It must be operated with freight and express to become paying proposition," he said, "and I would like to see postal companies carrying the mail under contract with the Government, as the railroads do now."

The Postmaster General talked of the vast changes in the postal service that have come into effect within a comparatively few years. He recalled the days when the pony express rider rode from town to town along the Western frontier carrying the mail in a sack strapped to his saddle, and noted that it seemed hard to believe that a letter posted in New York one afternoon would be delivered in Chicago shortly after breakfast the next morning.

Cleveland

At least 280,000 were lucky enough to get within sight of the Cleveland airport, where they could at least see the deafening roar of the giant, floodlights and hear the roar of the engines. Nobody will ever know, say Traffic Commissioner Edward J. Donohue, would not even venture a guess how many tried to get out to the airport and gave it up as a hapless task.

It was the most broad-based demonstration of public interest within the agency at the oldest Cleveland efforts. The press through which stormed the airport was only a small part of those taking part.

At any day long the field was crowded with people, many of whom came to see the extraordinary collection of animals—the enormous plumes, the big Douglas pheasants like those the world has never seen, and the Marine mammals made in Cleveland the big gray West coast porpoises and the sea maul's petrels—old Dr. Henshaw. But the real feature of the show, which drew the hundreds of arrivals and departure of the road there.

Least J. T. Henshaw of McCook, Field, was thousands of feet in the air performing illuminating stunts, when the crowd was broken by him by some dark and clear the

Among the writing places at the Cleveland Airport were a *Poker Magazine* from Detroit; Yusef Murr's *Assessment*; Ralph Thomas's *Curtain*; a Martin Bomber from Salford's Field; another Martin Bomber, equipped for night flying, from McCook Field; the *Screen II* of the Detroit Airways; three great planes from Salford's Field; Norwood's *Waco* from Chippewa Lake; General Peck's

DBI, V. J. Stawick and Guy McLaughlin from Akron in
Curtis, Joseph Koch in a Curtiss from Taylorport Lake
a Vaught from Dayton, signed for a fireworks display
Laid from Detroit; another Vaught from Dayton, equipped
for night flying; Art Smith with a Martin Commercial;
Douglas Transport from McCook Field, two DBFs from Mc-
Cook Field; a Curtiss PW8 from McCook; a Navy seaplane
from the Martin Field; another Martin Commercial; and the
Vaught from Dayton, a Short all-India Air Pullman from
Detroit, a Martin Commercial from New York with a
passenger, and a Curtiss from New York with a Curtiss Oriole
with William Aftand and the Spaulding Construction Com-
pany's owner.

Chicago's first plane took the air at 2:58 p.m., Chicago time. It was piloted by Mackay J. Short, a veteran of the service, and at 10:30, eastern standard time, also Chicago daylight saving time—less than 3 hr. after it took the air—the city was reported as landed in Cleveland—only fourteen minutes was consumed in transferring the art from the original plane to another, for at 10:45, Pilot F. Collins left on the second leg to New York.

Police and special guards had difficulty at Maywood Park with the crowd. The thousands who gathered west of Maywood ranged closely around the slope until almost the moment of detonation.

Postmaster Arthur C. Lueder, Paul Henderson, second-in-command postmaster general, and C. F. Eggs, General Superintendent of Air Mail, were among the prominent persons in the send-off of the two first night planes leaving Chicago in the east. The crowd gathered about them as they stood by Pilot Sher's ship discussing the flight with him and bidding him good luck.

Almost at the last moment before Pilot Short's departure two large boxes of letters arrived from the donors's post office to be put aboard the plane. One of these proved to be a box from Vice-President Charles G. Dawes to Col. John Coughlin, father of the President, who is everywhere after an opinion. It was addressed to Col. Coughlin at Plymouth, Va.

The other half was for Miss Grace George, actress, and addressed to her New York residence. It was sent by the radio station, WHT, from which the announcement, including speeches by Vice-President Davis and Mr. Henderson, were broadcast.

When Pilot George Meyer hopped off at 8:30 Chicago time it was much the same, except that the sun had set, and the field was flooded by lights. Many of the crowd remained to see the second take-off.

The transcontinental service, which dominated the progress of the infant air road, may soon be discontinued, (Curtis Henderson noted in his speech). It doesn't say.

"To look New York and San Francisco as vast sea-lands of miles of desert and mountains," said Colonel Henderson. "We took towns of little importance. And when it is all done little has been accomplished. New York and San Francisco have not much to commend. In New Jersey, for example, they've never heard of San Francisco. In California, they don't know where Nevada is."

The Route

The schedule for the transcontinental route was based on a combination of geographic and weather conditions, emphasizing prevalent fogs at both ends of the route, the seasonal monsoon regime, and the first frost country in between, which for night flying. Grouping the way, with no parallelism for passengers, it was nevertheless clear that the transatlantic route could be chosen as the scene for first experiments in night flying. Of course, therefore, the amount of available land traffic became a matter of secondary consideration. Yet the time and problems of opening night and day between New York and San Francisco were still unsolved. Colonel Roscoe began preparations for the New York-Chicago route at San Francisco.

The pilot departs secure in the knowledge that what appears to be a wall of darkness before him has been rendered comparatively safe by a series of 180 beacons scattered along

[illegible]

Unloading the first night air mail to be received in New York from Chicago. *Phil Paul (Day)* Collects at the right

For 60 yr, he knows his way around the western slopes by heart—the Blue Ridge Mountains of the Smokies. For the next 40 yr he is in the midst of what has been considered to be the most dangerous flygging country in the world. The mountains, though not more than 2,000 ft high, are almost without exception heavily timbered. Their configuration is such that one, when there is no timber on the open spaces or frequently found in the Rockies and not entirely absent in the Smokies, are justifiably uncontented. In this country, the trees are so thick that the only way an airman can get out of the emergency landing fields, such of which has a few million could-power horses, with nothing beneath between to make the flyer go on course.

The following is the sequence from East to West of the Emergency Landing Fields and In-Between Lights of the aerial railway, New York to Cleveland. Emergency Fields are shown in CAPITAL LETTERS.

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8. HANLEY FIELD, NEW BUNSWICK, N. J. (New York Turnpike)
Interstate Light, Gloucester, N. J.
9. WYTHEBOROUGH, N. J.
Cedarbrook Services Light, Amador's, N. J.
10. WYTHEBOROUGH, N. J.
Cedarbrook Services Light, Amador's, N. J.
11. WYTHEBOROUGH, N. J.
Cedarbrook Services Light, Amador's, N. J.
12. WYTHEBOROUGH, N. J.
Cedarbrook Services Light, Amador's, N. J.
13. WYTHEBOROUGH, N. J.
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14. WYTHEBOROUGH, N. J.
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19. WYTHEBOROUGH, N. J.
Cedarbrook Services Light, Amador's, N. J.
20. WYTHEBOROUGH, N. J.
Cedarbrook Services Light, Amador's, N. J.

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core, its special alloy elec-
trodes, and its two-piece,
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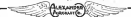
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